US007516977B2

(12) **United States Patent**
Wu et al.

(10) **Patent No.: US 7,516,977 B2**
(45) **Date of Patent: Apr. 14, 2009**

(54) **SEAT ADJUSTING MECHANISM OF A MOTORIZED WHEELCHAIR**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 455 days.

(21) Appl. No.: **11/392,796**

(22) Filed: **Mar. 30, 2006**

(65) **Prior Publication Data**

US 2007/0235965 A1 Oct. 11, 2007

(51) **Int. Cl.**
B62B 1/00 (2006.01)

(52) **U.S. Cl.** **280/650**; 280/47.38; 297/344.17; 254/122

(58) **Field of Classification Search** 280/47.38, 280/650, 638, 29, 47.33, 287, 278, 639, 47.25; 297/344.12, 344.15, 344.17, 344.16, 330; 248/421, 371, 185.1, 396, 398, 454; 187/243, 187/244, 269, 272, 211; 254/122, 211, 269
See application file for complete search history.

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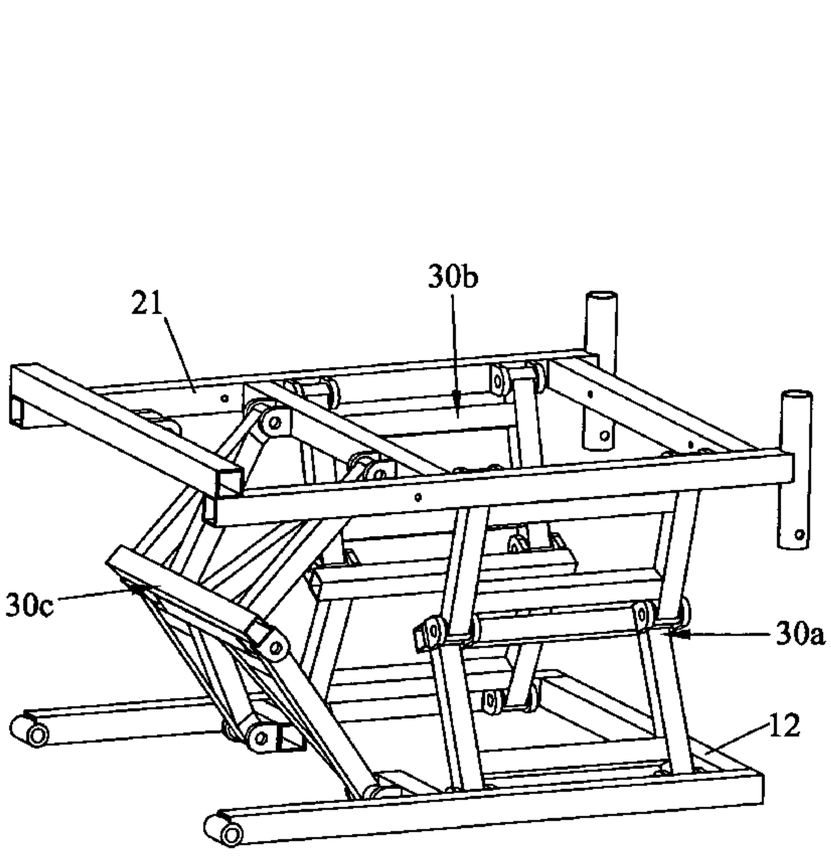
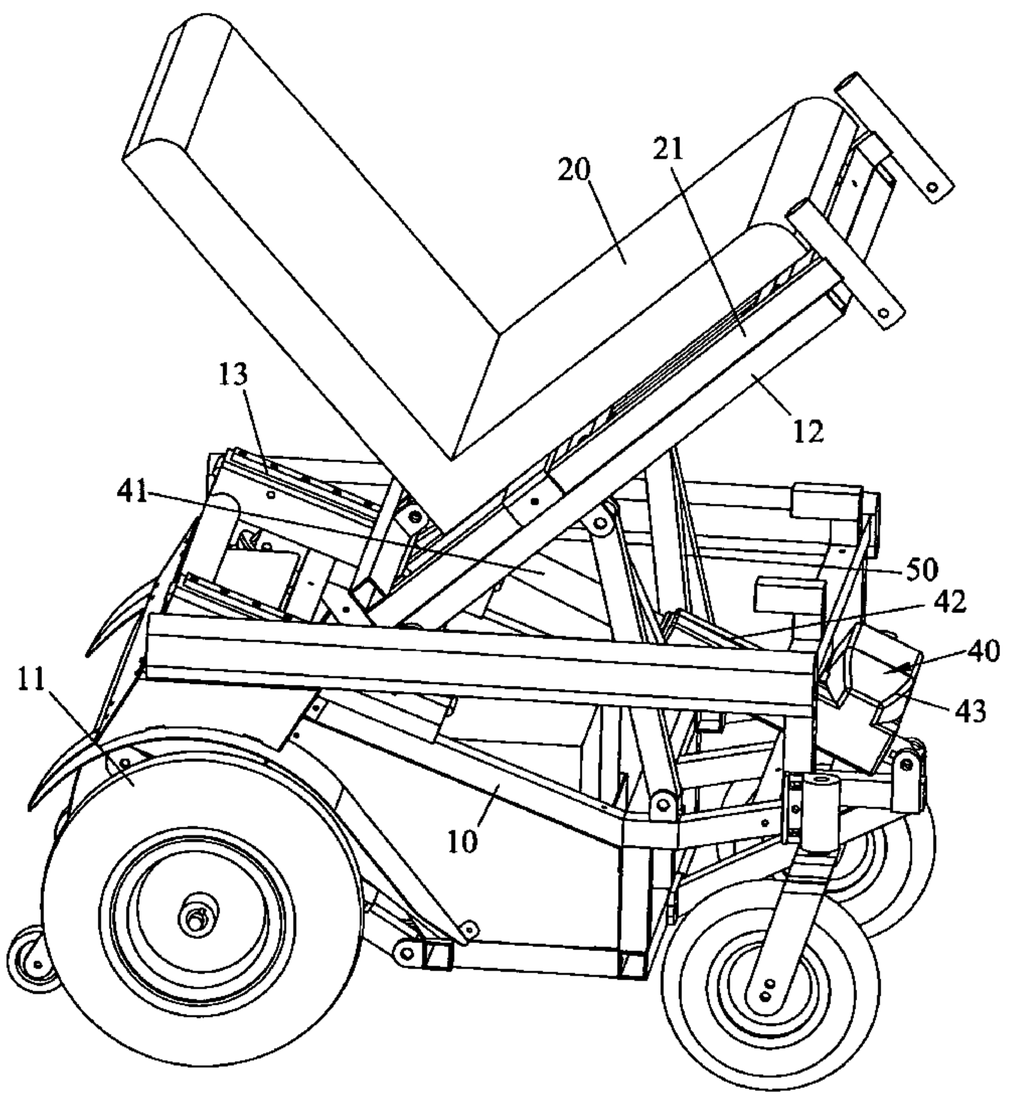
(57) **ABSTRACT**

The purpose of this invention is to enhance the stability of seat up-down adjustment and the aesthetics of a wheelchair. The mechanism is structured by the cart frame, the seat, the linking rod mechanism and the linear motion actuator. There are at least two linking rod mechanisms, each mechanism is composed of several connecting frames and pivot-linked with each others and remains two distal ends for connecting to the cart frame and the seat. The linear motion actuator connects the cart frame and the seat, moves the seat up and down smoothly with help from the stable supporting of the linking rod mechanism. The whole adjustment mechanism is confined in between the seat and the cart frame, which minimizes the needed space and makes a nice figure.

16 Claims, 7 Drawing Sheets





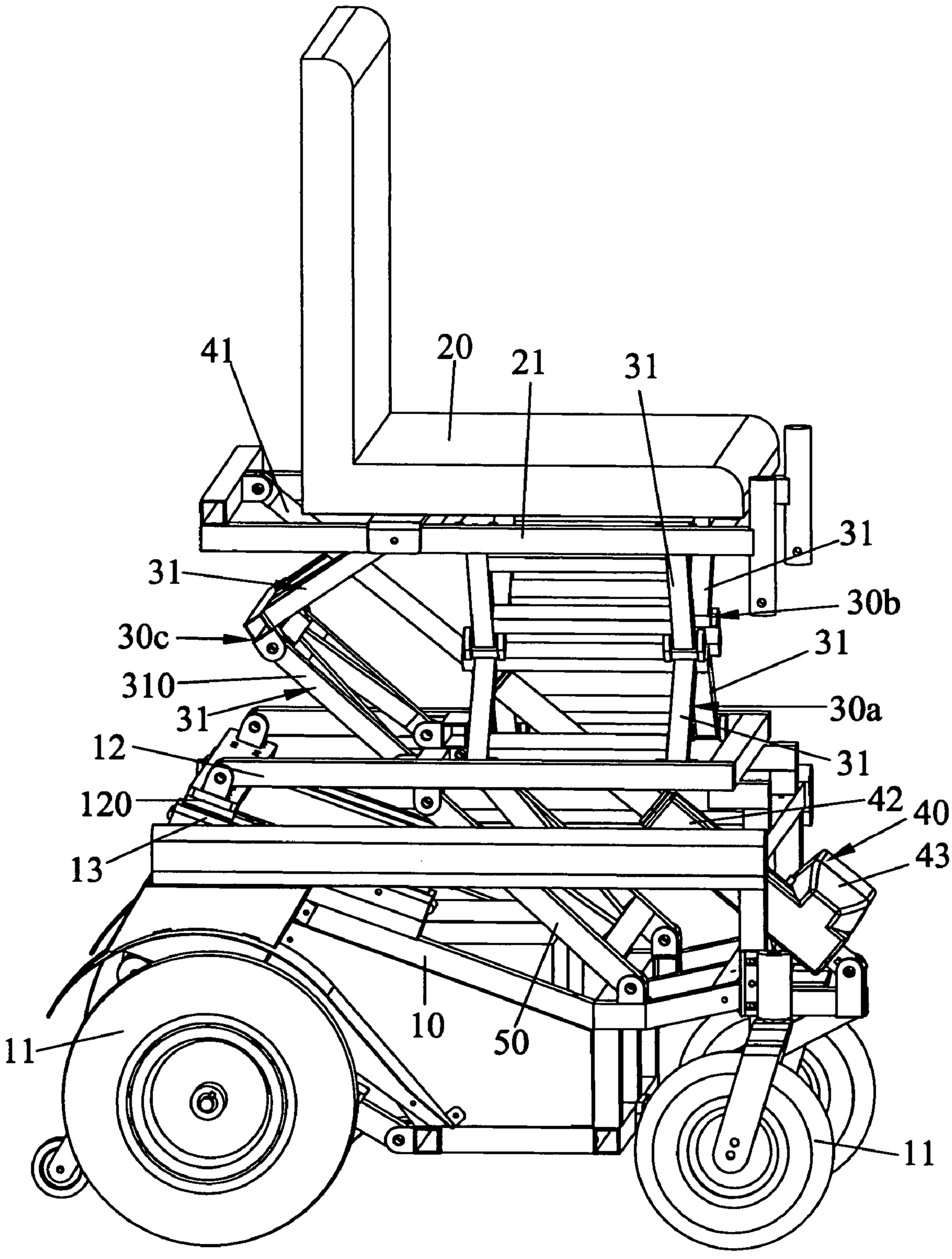

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FIG.1

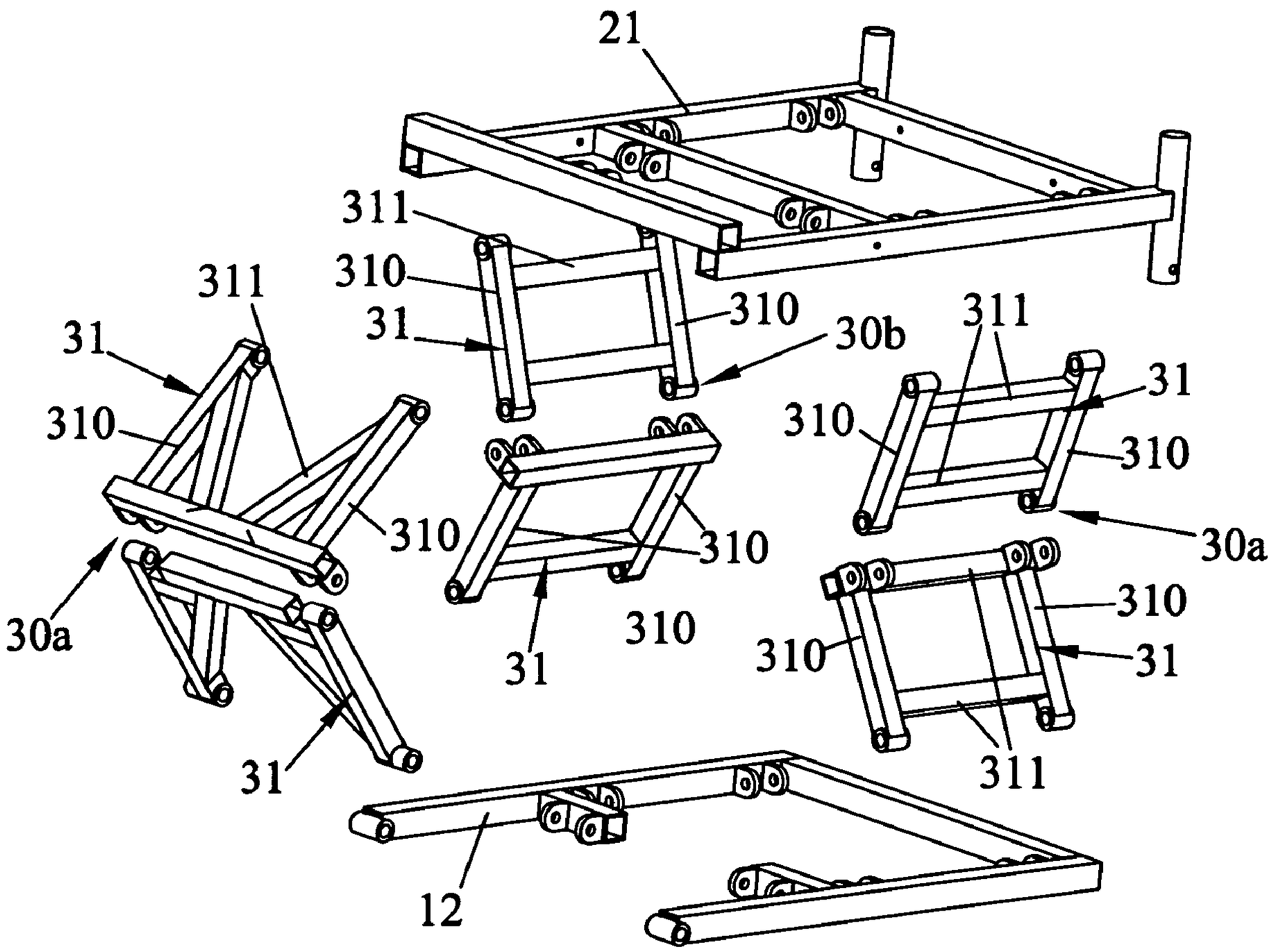
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FIG.2

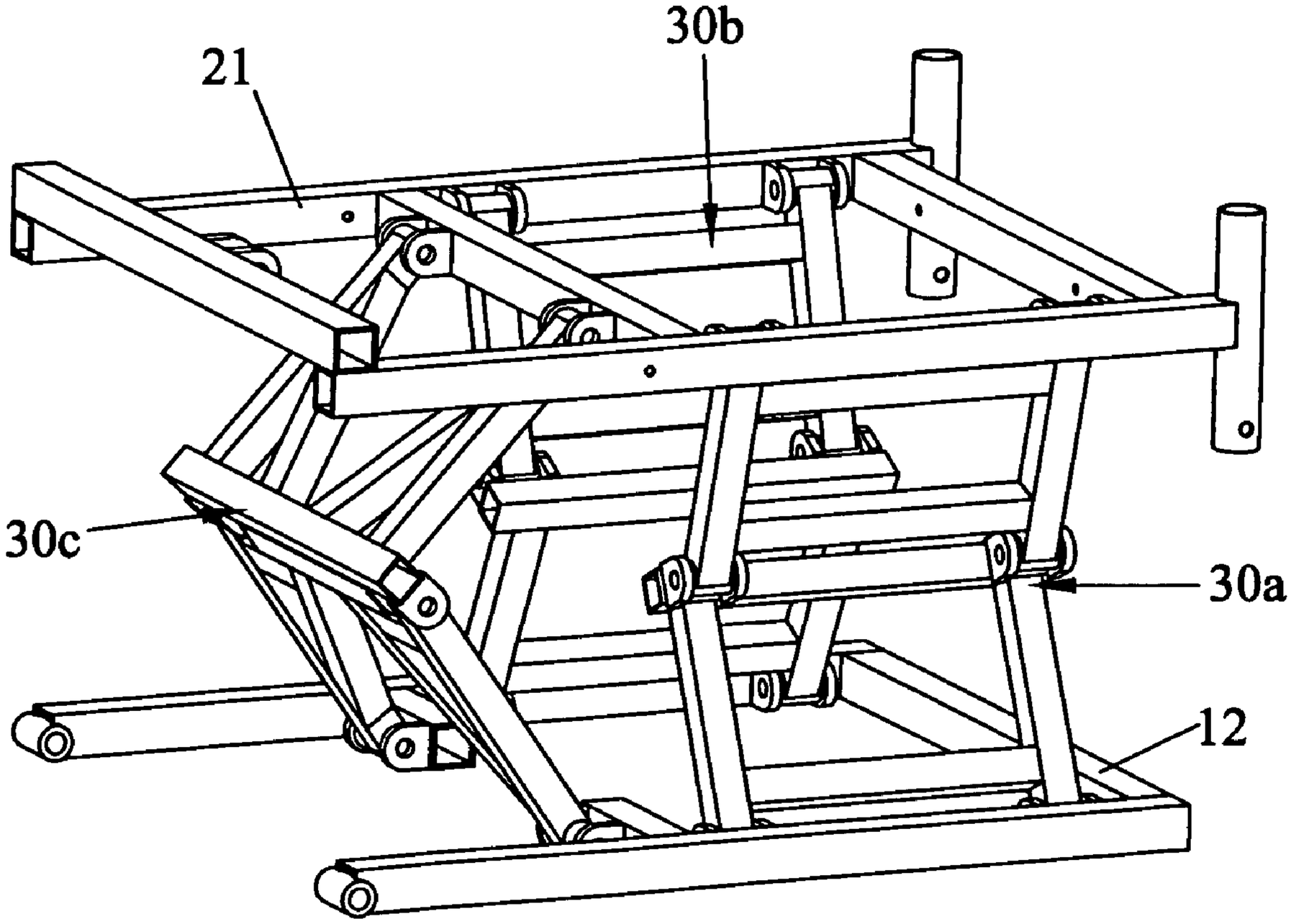

FIG.3

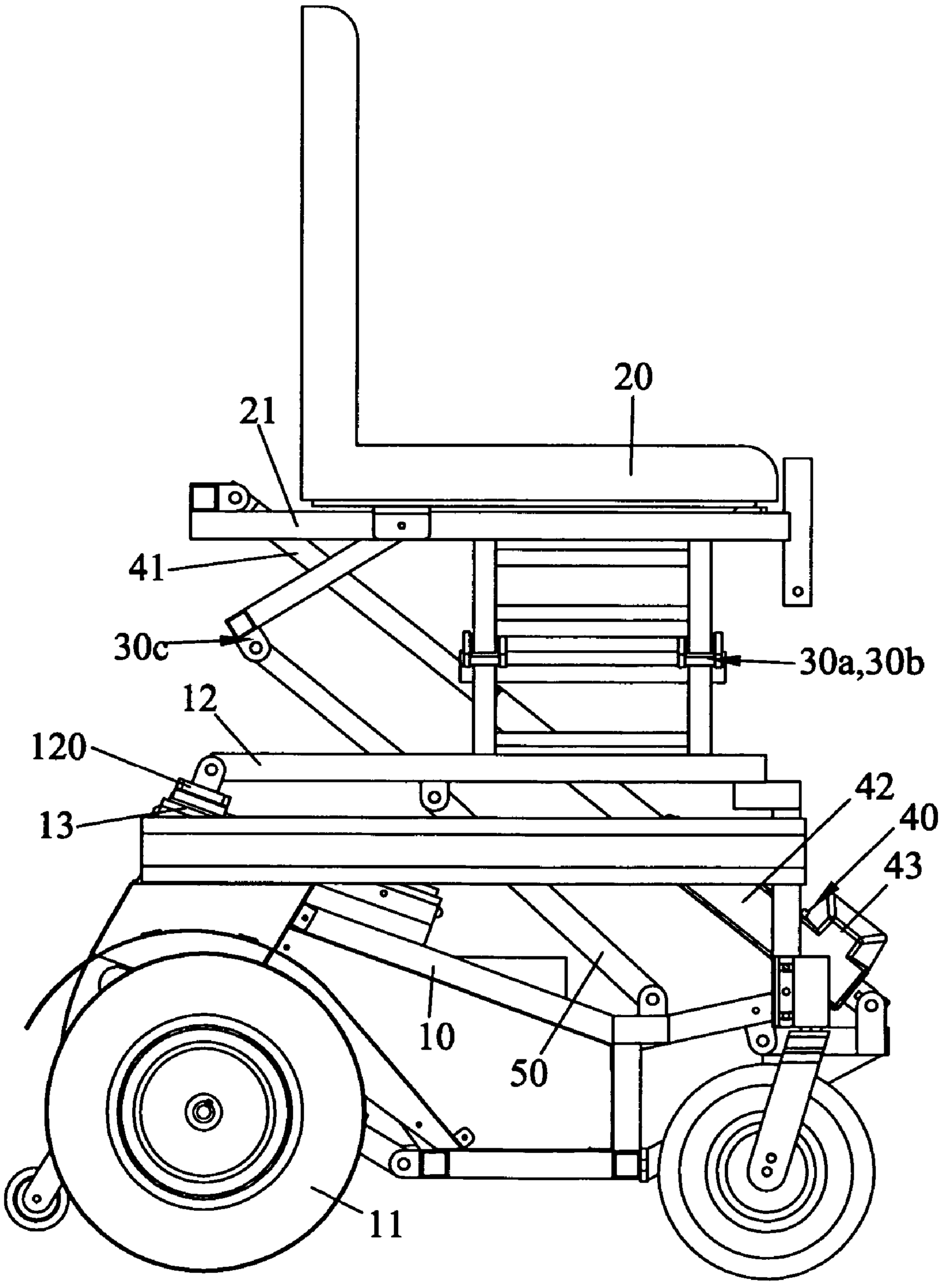

FIG.4

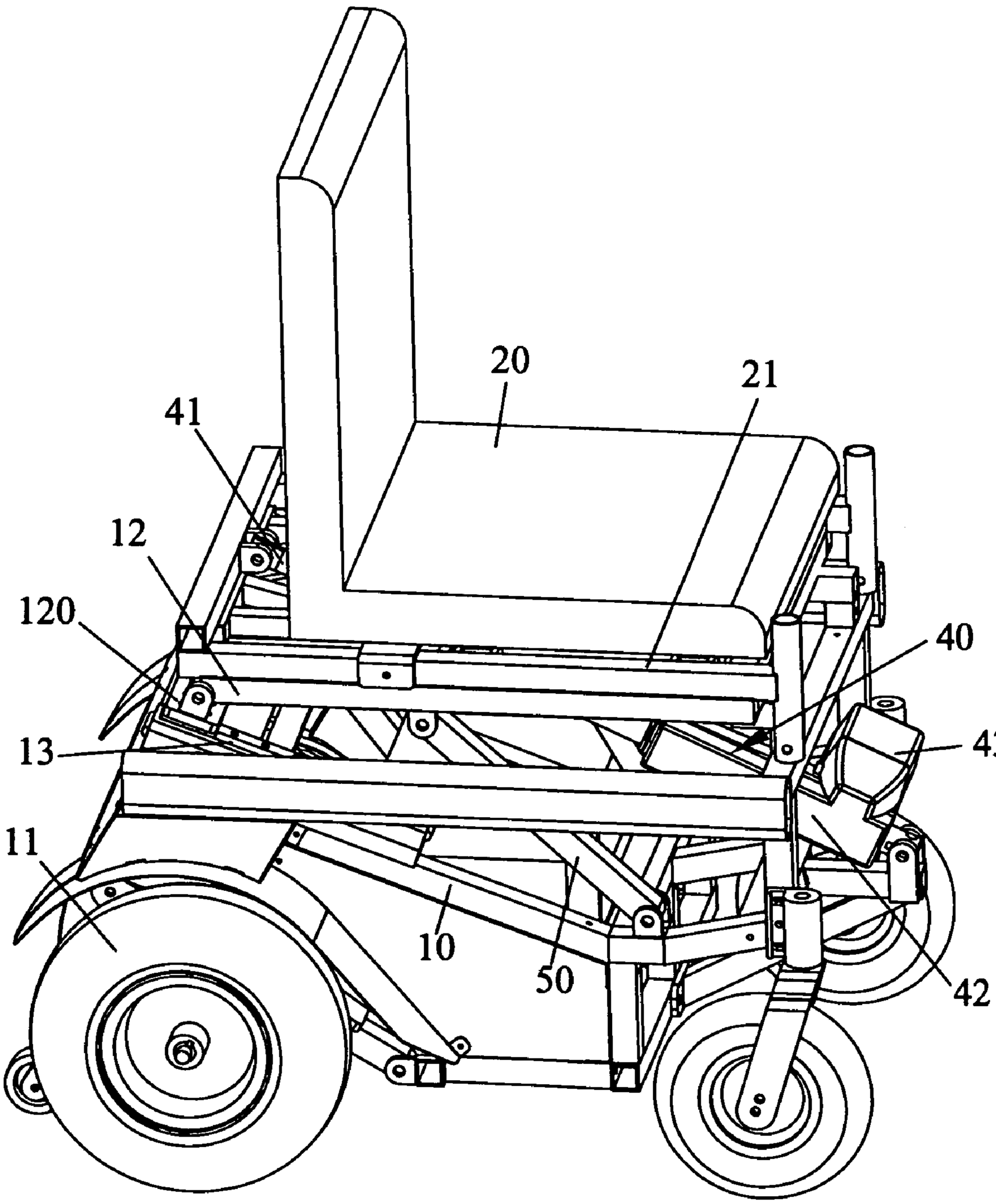

FIG.5

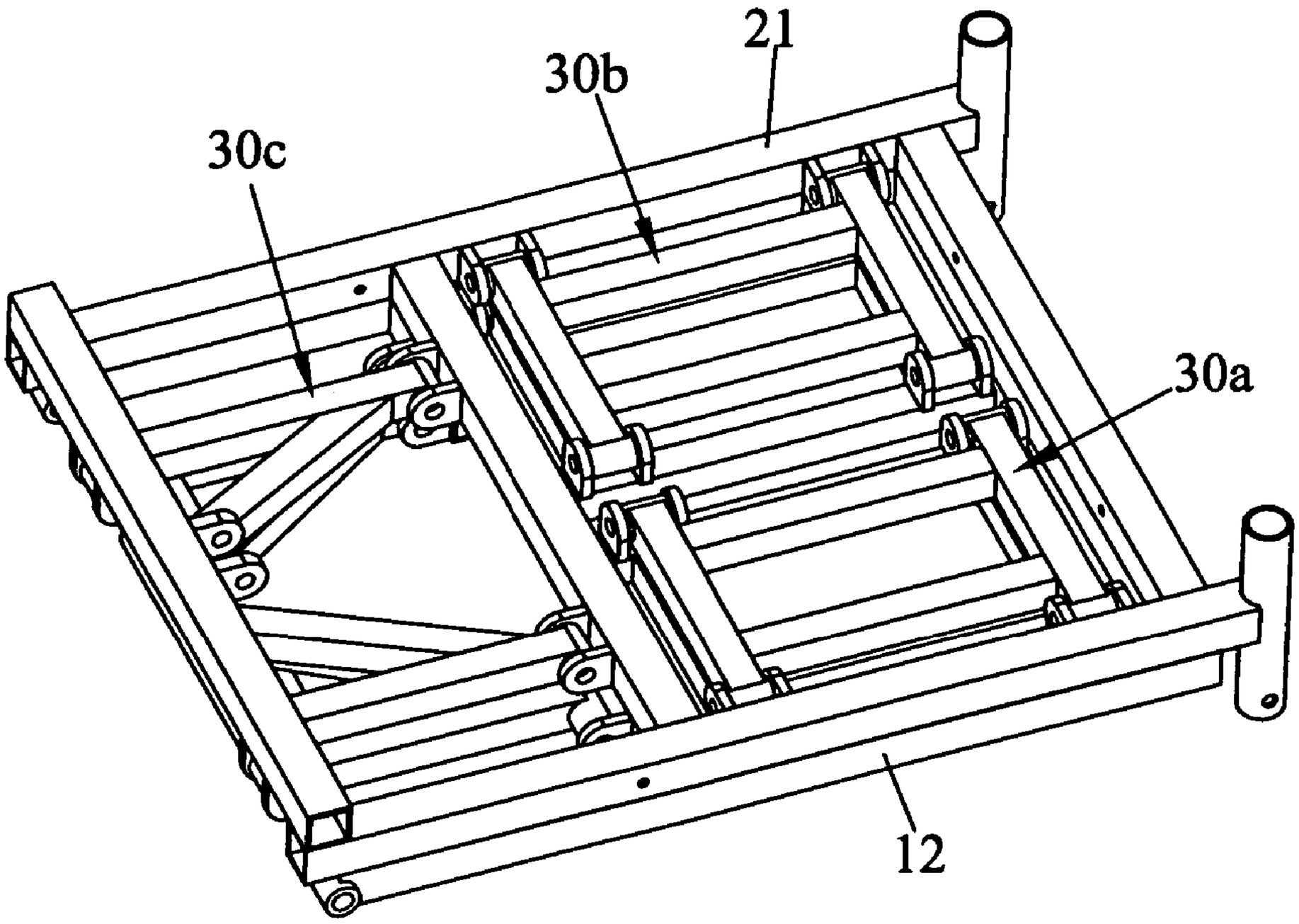

FIG.6

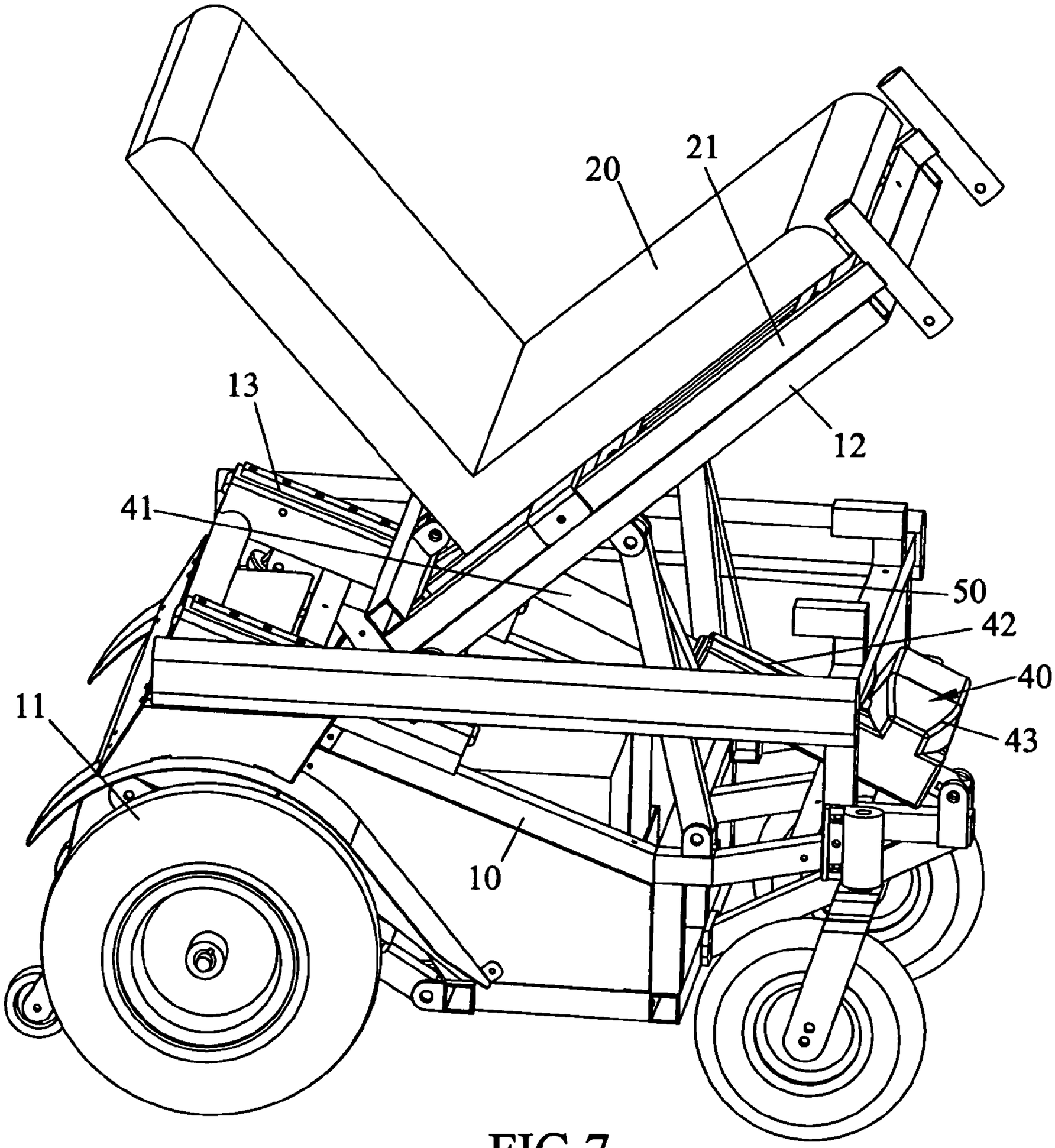

FIG.7

SEAT ADJUSTING MECHANISM OF A MOTORIZED WHEELCHAIR

FIELD OF THE INVENTION

This present invention relates to a seat adjusting mechanism of a motorized wheelchair, specifically a kind of linking rod mechanism which is structured by a cart frame, a seat and plurality connecting frames pivot-linked with each others, the seat moves smoothly up and down relatively to the cart frame, driven by a linear motion actuator, the linking rod mechanism is hidden in a way of nice figure.

BACKGROUND OF THE INVENTION

There are varieties of wheelchairs, most of the conventional wheelchairs do not have seat adjusting mechanisms, recently to enhance convenience and comfort in use, some seats are designed with up-down adjustable or lean adjustable mechanism. However, the current common seen wheelchair seat adjusting mechanism moves the seat up and down by a simple linking rod with actuator, e.g. U.S. Pat. No. 5,924,720, the seat is up-down adjustable with a 4 linking-rod mechanism composed of continuous 2 linking rod in between the cart frame and the seat frame together with a linear motion actuator, this commonly applied mechanism takes a lot of space which makes driving difficult and inconvenient in transportation. There are some other kinds of well known wheelchairs equip with seat up-down adjusting mechanisms, but there is nothing like this invention which is a mechanism designed to minimize space and is hidden in a way of nice figure.

In addition to the function of seat up-down adjustment, the main mechanism of this invention can be extended in design to have a function of seat lean adjustment. A current common seen wheelchair has the function of seat lean adjustment, i.e. U.S. Pat. No. 6,776,430, which has a linking rod and an actuator between the cart frame and the seat frame; a guide rail which rising gradually and extending to the front is installed on the cart frame; a slide which installed on the seat frame which slides along the guide, when the actuator pulls back, the rear side of the seat frame is pulled forward and raised, then the seat frame is leaned. However, it does not have the function to control the seat up and down; furthermore, the guide rail is rising and extending to the front, when the seat is leaned, the height of the seat is increased, which causes unstable, uncomfortable and dangerous to the rider.

SUMMARY OF THE INVENTION

The purpose of this invention is to enhance the stability of the seat up-down adjustment and the aesthetics of a wheelchair. The mechanism is structured by the cart frame, the seat, the linking rod mechanism and the linear motion actuator. There are at least two linking rod mechanisms, each mechanism is composed of several connecting rods in even number and pivot-linked with each others, and connected to the cart frame and the seat at the two ends. The linear motion actuator connects a cart frame and a seat, moves the seat up and down smoothly with help from the stable supporting of the linking rod mechanism. The whole adjustment mechanism is confined in between a seat and a cart frame, which minimizes the needed space and makes a nice figure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a 3-dimensional diagram showing the rising status of the seat of the present invention.

FIG. **2** is an exploded view of the linking rod mechanism of the present invention.

FIG. **3** is a composition diagram of the linking rod mechanism of the present invention.

FIG. **4** is a side view showing the rising status of the seat of the present invention.

FIG. **5** is a 3-dimensional diagram showing the seat in original status of the present invention.

FIG. **6** is a diagram showing the fold status of the linking rod mechanism of the present invention.

FIG. **7** is a diagram showing the lean status of the seat of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. **1** to **3**, the mechanism of this invention can achieve to simply the seat frame, to stabilize the up-down motion, and to minimize the needed space. The basic compositions are:

A cart frame **10**, with wheels **11** connected thereon, and having a rear end, a front end and a longitudinal axis extending from the rear end to the front end of the cart frame.

A seat **20**.

A linking rod mechanisms **30***a* and **30***b*, each includes plurality connecting frames **31** which are pivot-linked with each others and remains two distal ends, and the two distal ends are respectively connected to the cart frame **10** and the seat **20**. In one embodiment of the invention, the cart frame **10** further comprises a primary frame **12**, the primary frame **12** is connected to the cart frame **10**, the seat **20** is installed on a secondary frame **21**, and the two distal ends of the mechanisms **30***a*/**30***b* are respectively pivotally connected to the primary frame **12** and the secondary frame **21**. One advantage design of afore-mentioned embodiment, the plurality connecting frames of the linking rod mechanisms are foldable within the confined space by the primary frame **12** and the secondary frame **21** so as to minimize the needed space.

A linear motion actuator **40** connects the cart frame **10** and the seat **20** (or the secondary frame **21**) moving the seat **20** up and down smoothly with help from the stable supporting of the linking rod mechanisms **30***a*/**30***b*/**30***c*.

One improved application of this invention reinforces the strength of connection frames **31** by using two parallel connection rods **310**, and the two parallel connection rods **310** are connected with each other by plurality connection rods **311** to form a rigid frame.

Referring to FIGS. **3** and **6**, the other improved application of this invention hides the connection frames **31** to enhance a nice figure when the seat **20** (or the secondary frame **21**) is adjusted to the lowest position; a primary frame **12** is connected to the cart frame **10**, a secondary frame **21** is mounted on the seat **20**, the two ends of the connection frames **31** are connected to the primary frame **12** and the secondary frame **21**, the connection frames **31** fold within the confined space by the primary frame **12** and the secondary frame **21**.

Another improved application of this invention reinforces the structure strength and stability; the connection frames **31** connect to the seat **20** (or the secondary frame **21**) with double pivots at one end and connect to the cart frame **10** (or to the primary frame **12**) with also double pivots at the other end.

In another improved application of this invention, the triple linking rod mechanisms **30***a*, **30***b* and **30***c* are utilized, and at least two linking rod mechanisms **30***a* and **30***b* are positioned

symmetrically about a vertical midplane containing the longitudinal axis extending from the rear end to the front end of the cart frame **10**.

In another application of this invention, the linear motion actuator **40** is a kind of motor cylinder that includes a pair of rod **41** and cylinder **42** and a motor **43** to activate the motion.

Referring to FIGS. **1** and **7**, this invention not only has the function of controlling the seat up-down but also the function of controlling the gradient of the seat **20**, a mechanism is consisted of two lean slide rails **13** which extend downward to the front of the cart frame **10**, the first end of a rigid connecting rod **50** is pivotally connected to the cart frame **10**, the second end of the connecting rod **50** is pivotally connected to the middle portion of the primary frame **12**, the ends of the connecting frames **31** of the linking rods mechanisms **30***a* and **30***b* are connected to the primary frame **12**, one end of the primary frame **12** comprises a slide **120** attached to the slide rail, when the actuator **40** shrinks and drives the seat **20** (or the secondary frame **21**), which can move the primary frame **12** in succession and make the slide **120** move to the lower position along the slide rail **13** to make the seat **20** (or the secondary frame **21**) in a lean status. The improved application is that the two ends of the connecting rods **31** are pivot-linked to the primary frame **12** and the seat **20** (or the secondary frame **21**) with two pivots in order to enhance the strength and stability of the structure.

Referring to FIGS. **1** to **4**, the improved application of this invention, when the user wants to rise the seat frame, the user controls the actuator **40**, the motor **43** of the actuator **40** operates and drives the rod **41** stretch out relative to the cylinder **42**, which makes the whole length longer than the basic length preserved, because the seat **20** (or the secondary frame **21**) and the primary frame **12** are connected by at least two linking rod mechanisms **30***a* and **30***b*, every linking rod mechanism **30***a*/**30***b* is pivot-linked by several connecting frames **31**, which has not only abundant space to stretch, but also the function to prevent the seat **20** from shivering, then the seat **20** can be risen smoothly. When the user wants to make the seat **20** down to the normal position, the user controls the actuator **40**, the motor **43** of the actuator **40** operates and drives the rod **41** shrink relative to the cylinder **42**, which makes the whole length equal to the basic length preserved, the seat **20** goes down, the connecting frames **31** of the linking rod mechanisms **30***a* and **30***b* fold, the seat **20** and the primary frame **12** are shut and combined with the cart frame **10** into a firm status, which makes the seat **20** down to the normal position and can be driven.

Referring to FIGS. **5** to **7**, when the seat **20** is in a normal position, the user wants to make the seat **20** into a lean status, the user controls the actuator **40**, the motor **43** of the actuator **40** operates and drives the rod **41** shrink relative to the cylinder **42**, which makes the whole length shorter than the basic length preserved, then the rod **41** of the actuator **40** drives the back end of the seat **20** and the primary frame **12** toward to the front of the cart frame **10**, because the slide rail **13** slopes downward to the front of the cart frame **10**, the back end of the primary frame **12** moves downward to the front of the cart frame **10** by the slide **120** moving along the slide rail **13**, so does the seat **20** (and the secondary frame **21**), which cooperating with the connecting rod **50** supported on the middle of the primary frame **12** to make the seat **20** into a lean status like showing in FIGS. **5** and **6**. When the user wants to reinstate to the original status, the user controls the actuator **40**, the motor **43** of the actuator **40** operates and drives the rod **41** stretch out relative to the cylinder **42**, which makes the whole length equal to the basic length preserved, the seat **20** (and the secondary frame **21**) and the primary frame **12** reinstate to the horizontal status.

There are the following advantages about this present invention according to the designs said above:

1. The prevent invention can reach the function of the seat frame up-down steadily with the steady support of the at least two linking rod mechanisms, and the whole adjustment mechanism is confined in between the seat frame and the cart frame, which minimize the needed space and make a nice figure.

2. The present invention can be simply designed to have the function of the seat lean, the seat up-down and seat lean can be simply controlled by only one motor cylinder, which can save the cost of the parts and equipments.

While we have shown and described the embodiment in accordance with the present invention, it should be clear to those skilled in the art that further embodiments may be made without departing from the scope of the present invention.

What is claimed is:

1. A seat adjusting mechanism of a motorized wheelchair comprising:

a cart frame with wheels connected thereon, and having a rear end, a front end and a longitudinal axis extending from the rear end to the front end of the cart frame;

a seat;

three linking rod mechanisms, each including two connecting frames and each connecting frame including two parallel connecting rods which are connected to another connecting rods to form a rigid rectangular frame, the two connecting frames of each linking rod mechanism pivot-linked with each other and having two distal ends, the distal ends of each linking rod mechanism respectively connected between the cart frame and the seat, two linking rod mechanisms positioned symmetrically about a vertical midplane containing the longitudinal axis extending from the rear end to the front end of the cart frame; and

a linear motion actuator connecting the cart frame and the seat so as to actuate the seat frame to move relatively to the cart frame.

2. The seat adjusting mechanism as claimed in claim **1**, wherein the cart frame comprises a primary frame, and the seat is mounted on a secondary frame, the primary frame is connected to the cart frame, the two distal ends of the linking rod mechanisms are connected to the primary frame and the secondary frame, the connecting frames of the linking rod mechanisms are foldable within the confined space by the primary frame and the secondary frame.

3. The seat adjusting mechanism as claimed in claim **1**, wherein the two distal ends of each of the linking rod mechanism are respectively pivot-linked to the cart frame and the seat frame with two pivots.

4. The seat adjusting mechanism as claimed in claim **1** wherein the linear motion actuator is a motor cylinder which comprises a pair of rod and cylinder, and a motor driving the rod lengthen and shorten relative to the cylinder.

5. The seat adjusting mechanism as claimed in claim **2**, wherein the cart frame comprises two lean slide rails which extend downward to the front of the cart frame, the cart frame is pivotally connected a first end of a rigid connecting rod, the rigid connecting rod has a second end which is pivotally connected to the middle portion of the primary frame, one end of the primary frame comprises a slide attached to the slide rails, when the actuator shrinks and drives the seat frame, which can move the primary frame in succession and make

the slide move to the lower position along the slide rails to make the seat frame in a lean status.

6. The seat adjusting mechanism as claimed in claim **2**, wherein the two distal ends of each linking rod mechanism are pivot-linked to the primary frame and the secondary frame with two pivots.

7. The seat adjusting mechanism as claimed in claim **1**, wherein the cart frame comprises a primary frame, and the seat is installed on a secondary frame, the primary frame is installed on the cart frame, the two distal ends of the linking rod mechanisms are connected to the primary frame and the secondary frame, the cart frame comprises two lean slide rails which extend downward to the front of the cart frame, the cart frame is pivotally connected a first end of a rigid connecting rod, the rigid connecting rod has a second end which is pivotally connected to the middle portion of the primary frame, one end of the primary frame comprises a slide attached to the slide rails.

8. A seat adjusting mechanism of a motorized wheelchair comprising:

a cart frame with wheels connected thereon, and having a rear end, a front end and a longitudinal axis extending from the rear end to the front end of the cart frame, the cart frame comprising a primary frame connected thereto;

a seat mounted on a secondary frame;

three linking rod mechanisms, each including two connecting frames and each connecting frame including two parallel connecting rods which are connected to another connecting rods to form a rigid rectangular frame, the connecting frames of the linking rod mechanisms foldable within the confined space by the primary frame and the secondary frame, the two connecting frames of each linking rod mechanism pivot-linked with each other and having two distal ends, the distal ends of each linking rod mechanisms respectively connected between the primary frame on the cart frame and the secondary frame on the seat, wherein two linking rod mechanisms positioned symmetrically about a vertical midplane containing the longitudinal axis extending from the rear end to the front end of the cart frame; and

a linear motion actuator connecting the cart frame and the seat so as to actuate the seat frame to move relatively to the cart frame.

9. The seat adjusting mechanism as claimed in claim **8**, wherein the linear motion actuator is a motor cylinder which comprises a pair of rod and cylinder, and a motor driving the rod lengthen and shorten relative to the cylinder.

10. The seat adjusting mechanism as claimed in claim **8**, wherein the cart frame comprises two lean slide rails which extend downward to the front of the cart frame, the cart frame is pivotally connected a first end of a rigid connecting rod, the rigid connecting rod has a second end which is pivotally connected to the middle portion of the primary frame, one end of the primary frame comprises a slide attached to the slide rails, when the actuator shrinks and drives the seat frame, which can move the primary frame in succession and make the slide move to the lower position along the slide rails to make the seat frame in a lean status.

11. The seat adjusting mechanism as claimed in claim **8**, wherein the two distal ends of each linking rod mechanism are pivot-linked to the primary frame and the secondary frame with two pivots.

12. The seat adjusting mechanism as claimed in claim **8**, wherein the cart frame comprises a primary frame, and the seat is installed on a secondary frame, the primary frame is installed on the cart frame, the two distal ends of the linking rod mechanisms are connected to the primary frame and the secondary frame, the cart frame comprises two lean slide rails which extend downward to the front of the cart frame, the cart frame is pivotally connected a first end of a rigid connecting rod, the rigid connecting rod has a second end which is pivotally connected to the middle portion of the primary frame, one end of the primary frame comprises a slide attached to the slide rails.

13. A seat adjusting mechanism of a motorized wheelchair comprising:

a cart frame with wheels connected thereon, and having a rear end, a front end and a longitudinal axis extending from the rear end to the front end of the cart frame, the cart frame comprising a primary frame connected thereto and two lean slide rails which extend downward to the front of the cart frame, the cart frame pivotally connected a first end of a rigid connecting rod, the rigid connecting rod having a second end which is pivotally connected to the middle portion of the primary frame, one end of the primary frame comprises a slide attached to the slide rails;

a seat mounted on a secondary frame;

three linking rod mechanisms, each including two connecting frames and each connecting frame including two parallel connecting rods which are connected to another connecting rods to form a rigid rectangular frame, the connecting frames of the linking rod mechanisms foldable within the confined space by the primary frame and the secondary frame, the connecting frames pivot-linked with each other and each including two distal ends, the distal ends of two of the linking rod mechanisms respectively connected between the primary frame on the cart frame and the secondary frame on the seat, two linking rod mechanisms positioned symmetrically about a vertical midplane containing the longitudinal axis extending from the rear end to the front end of the cart frame, a third linking rod mechanism pivotably connected between two respective ends of the cart frame and the seat: and a linear motion actuator connecting the cart frame and the seat so as to actuate the seat frame to move relatively to the cart frame, when the actuator shrinks and drives the seat frame, which move the primary frame in succession and make the slide move to the lower position along the slide rails to make the seat frame in a lean status.

14. The seat adjusting mechanism as claimed in claim **13**, wherein the linear motion actuator is a motor cylinder which comprises a pair of rod and cylinder, and a motor driving the rod lengthen and shorten relative to the cylinder.

15. The seat adjusting mechanism as claimed in claim **13**, wherein the two distal ends of each linking rod mechanism are pivot-linked to the primary frame and the secondary frame with two pivots.

16. The seat adjusting mechanism as claimed in claim **13**, wherein the cart frame comprises a primary frame, and the seat is installed on a secondary frame, the primary frame is installed on the cart frame, the two distal ends of the linking rod mechanisms are connected to the primary frame and the secondary frame, the cart frame comprises two lean slide rails which extend downward to the front of the cart frame, the cart frame is pivotally connected a first end of a rigid connecting rod, the rigid connecting rod has a second end which is pivotally connected to the middle portion of the primary frame, one end of the primary frame comprises a slide attached to the slide rails.

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